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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Western Wheatgrass Transplants Grow Well on Raw Mine Spoil¹

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Western wheatgrass plants grown in a nursery and set out in unweathered coal mine spoil survived and grew equally well whether mulched or not. Survival and growth during the year following planting, a very dry year, indicate that western wheatgrass plug transplants are well adapted to growing on raw coal mine spoil, and suggest that such transplants would be appropriate on small problem areas where direct seeding would have little chance of success.

Keywords: Rehabilitation, coal mine spoils, planting methods, *Agropyron smithii*.

Nursery-grown transplants can improve the chances for successful grass establishment on harsh, semiarid sites. This study was undertaken to determine the relative effectiveness of three planting methods, with and without straw mulch, on survival and subsequent vigor of western wheatgrass transplants on raw coal mine spoil at the McKinley mine, 20 mi (32 km) northwest of Gallup, N. Mex.

The wheatgrass was planted on essentially level, newly graded, unweathered overburden resulting from 1972 mining. The site is at an elevation of 6,885 ft (2,100 m) in the pinyon-juniper-sagebrush vegetation type, where annual precipitation averages about 15 in (38 cm).

The surface 12 in (30 cm) of material had a clay texture, with pH 7.3, electrical conductivity 5.02 mmhos, and 3.74% organic matter (somewhat high due to coal particles).

¹The research reported here is a contribution to the SEAM program. SEAM, an acronym for Surface Environment and Mining, is a USDA Forest Service program to research, develop, and apply technology that will help maintain a quality environment and other surface values while helping meet the Nation's mineral requirements.

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Methods

The plants were grown at the Coeur d'Alene Nursery in styroblock containers³, with bullet-

³Sjoberg, N. E. 1974. The styroblock container system. p. 217-228. In North Am. Containerized For. Tree Seedling Symp. Proc. Great Plains Agric. Publ. 68.

shaped cavities 1 in top diameter, 4.5 in deep, filled with a vermiculite-peat moss potting mixture. C-30 seed grown by the Los Lunas Plant Materials Center in New Mexico was used.

The plants were 6 weeks old when planted on September 17, 1975. The leaves were trimmed to 3 in (7.5 cm) at the time of planting. Three tools were used for making the holes in which the plugs were inserted:

1. Planting bar, a wedge-shaped tool, which made a hole 3 in (7.5 cm) wide, 6 in (15 cm) deep, and tapering from 1 in (2.5 cm) thick at the top to a sharp edge at the bottom.
2. Posthole digger, which produced a circular hole 4 in (10 cm) diameter and 6 in (15 cm) deep.
3. Round bar, of the approximate shape of the grass plugs, which made a hole 1.5 in (3.8 cm) in top diameter and 5 in (12.5 cm) deep, tapering to a point at the bottom.

The field design consisted of 22 replications of six plants planted in a row, 1 ft (30.5 cm) apart, two plants for each hole type, with straw mulch placed around one plant of each pair. A total of 132 plants were planted.

During the 5 weeks before planting, precipitation at the site totaled 3.50 in (8.9 cm). At the time of planting, soil moisture content in the top 6 in (15 cm) varied from 7.2% to 23.8% for the 22 replications, representing a range in tension from about 1 bar to over 15 bars. During the 5 weeks after planting, precipitation at the site totaled only 0.45 in (1.1 cm). Precipitation during the 13 months following planting, until the evaluation in October 1976, totaled 7.87 in (20.0 cm), about 50% below normal.

Results

On October 19, 1976, 90% of the plants were still alive. Differences in mortality due to method of planting or mulching were not significant.

Vigor of the live plants was judged on a 4-point scale: 1 = poor, 2 = fair, 3 = good, 4 = very good. Mean vigor for plants in the six treatment combinations varied between 3.36 and 3.74:

Planting Method	Mulch	No Mulch	Mean
Planting bar	3.36	3.47	3.42
Posthole digger	3.71	3.65	3.68
Round bar	3.74	3.45	3.59
Mean	3.60	3.53	

Most plants produced new shoots from rhizomes, even though the year was very dry. Differences in vigor due to planting method or to mulching were not significant. There also was no correlation between soil moisture at the time of planting and subsequent mortality or vigor.

Conclusions

Western wheatgrass plug transplants are well adapted to growing on raw coal mine spoil, are drouth resistant, and do not require mulching or a specific planting technique for successful establishment. These results suggest that western wheatgrass transplants would be useful in establishing this grass on small problem areas where direct seeding would have little chance of success.

